

between one of the ferromagnetic and nonmagnetic layers is not disclosed and is contrary to the teachings in the art.

Applicants note that the original claims are a part of the disclosure, and if the claims disclose an antiferromagnetic layer that is disposed between one of the ferromagnetic and nonmagnetic layers then the Examiner's interpretation is in error. Applicants appreciate the Examiners admission that such a limitation "is not disclosed and is contrary to the teachings in the art," demonstrating that a claim including that limitation is both novel and nonobvious. Applicants do not know which claim(s) to which the Examiner refers, and so cannot respond to the Examiners interpretation more specifically.

Specification

The Offices Action states: "The abstract is now limited to 150 words or 15 lines (37 CFR 1.72)."

Applicants are unaware of the law that the Examiner has quoted setting a limit of "15 lines." For convenience, the cited code section is quoted below:

A brief abstract of the technical disclosure in the specification must commence on a separate sheet, preferably following the claims, under the heading "Abstract " or "Abstract of the Disclosure." The abstract in an application filed under 35 U.S.C. 111 may not exceed 150 words in length. The purpose of the abstract is to enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure. The abstract will not be used for interpreting the scope of the claims.

In this regard the Offices Action also states "See MPEP § 608.01(b)."

The Examiner has apparently also misquoted the referenced MPEP section, which for convenience is quoted below:

The abstract should be in narrative form and generally limited to a single paragraph within the range of 50 to 150 words. The abstract should not exceed 25 lines of text. Abstracts exceeding 25 lines of text should be checked to see that it does not exceed 150 words in length since the space provided for the abstract on the computer tape by the printer is limited.

The Abstract as filed has 139 words and 18 lines, in conformance with 37 CFR §1.72.

Claims

1. 35 USC §112 ¶1

The Offices Action states:

Claims 6, 7, 9 and 17 - 20 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims contain reference to a third non-magnetic layer and/or a fourth ferromagnetic layer, yet the specification never describes a fourth ferromagnetic layer being present.

Referring to FIG. 3 for example, layer 104 may be a first ferromagnetic layer, layer 108 may be a second ferromagnetic layer, layer 111 may be a third ferromagnetic layer, and layer 112 may be a fourth ferromagnetic layer. The Office Action statements regarding 35 USC §112 ¶1 are therefore incorrect.

2. 35 USC §112 ¶2

The Offices Action states:

Claims 2 and 17 - 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 17- 20 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relative locations of the ferromagnetic layers, ferromagnetic "portions", and the non-magnetic layers, since the term "distal" in the claims is vague and indefinite. The examiner is unable to determine the scope of the present claims (see below for definition of the word "distal" from the Meriam-Webster dictionary).

Merriam-Webster definitions:

Main Entry: dis-tal

1: situated away from the point of attachment or origin or a central point especially of the body -- compare PROXIMAL

No indication is given in the Office Action as to why claim 2 is rejected under 35 USC §112 ¶2. Applicants have reviewed claim 2 and believe that it is in compliance with 35 USC §112 ¶2.

Applicants further do not understand what is vague about the term distal, which is commonly used in patent claims. For example, a brief search of recent patents which include the term “distal” in the claims, as well as the terms “magneto” and “resistive” yields 72 patents. Moreover, several such patents list the Primary Examiner as Paul Thibodeau, the Supervisory Primary Examiner for the present application. Are all of those patents invalid due to vagueness of the claims?

3. 35 USC §102

The Offices Action states:

Claims 1 - 7, 9 - 14 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ooshima et al. (U.S. Patent App. Pub. 2001/0033466 A1).

Regarding claims 1- 3, 11 and 14, Ooshima et al. disclose a sensor comprising first (*Figure 5, element 63*), second (*element 60*) and third ferromagnetic layers (*element 7a*) that are interleaved with first (*element 59*) and second (*element 7c*) electrically conductive nonmagnetic layers (*Paragraphs 0229, 0237 0238 and 0241*), said first nonmagnetic layer adjoining said first and second ferromagnetic layers (*elements 63/59/60*), said second nonmagnetic layer adjoining said second and third ferromagnetic layers (*elements 60/7c/17a*), said first and third ferromagnetic layers having magnetic moments with directions that are fixed in response to an applied magnetic field (*i.e. are "pinned" magnetic layers - see Figures 1 and 5; and Paragraphs 0085- 0094, 0105, and 0226*), said second ferromagnetic layer having a free portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field (*i.e. is a "free" magnetic layer- see Figures 1 and 5; and Paragraphs 0106 and 0226*), where said third ferromagnetic layer (*element 7a*) overlaps only a portion of said second ferromagnetic layer (*element 60*).

Regarding Ooshima et al., applicants respectfully assert that layer 59, which the Examiner terms “said first nonmagnetic layer,” does not adjoin layer 63, which the Examiner terms “said first ferromagnetic layer,” in contrast to claim 1.

Further, applicants respectfully assert that layer 7c, which the Examiner terms “said second nonmagnetic layer,” does not adjoin layer 60, which the Examiner terms “said first ferromagnetic layer,” in contrast to claim 1.

For at least these reasons, claim 1 and dependent claims 2 - 11 are not anticipated by Ooshima et al.

Claim 12 recites in part “said bias structure including a ferromagnetic bias layer exchange coupled to a portion of said free layer by a nonferromagnetic layer.” Ooshima et al. does not teach or suggest such a structure, and therefore claim 12 and dependent claims 13 - 16 are not anticipated by Ooshima et al.

Claim 17 recites in part “wherein said fourth ferromagnetic layer has a magnetic moment that is fixed in the presence of an applied magnetic field, said first and second portions of said third ferromagnetic layer have magnetic moments that are fixed in the presence of said applied magnetic field and said third portion of said third ferromagnetic layer has a magnetic moment that varies in response to said applied magnetic field.” Ooshima et al. does not teach or suggest such a structure, and therefore claim 17 and dependent claims 18 - 20 are not anticipated by Ooshima et al.

Applicants also respectfully disagree with the Office Action assertion that “the prior art product is substantially identical in structure to the claimed product.” Further, applicants respectfully assert that prior art must naturally and necessarily include a claim limitation that is not expressly disclosed in the prior art for that limitation to be considered inherent in the prior art. See, e.g., *Continental Can.*

4. 35 USC §103

The Office's Action states:

Claims 1- 5, 10- 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al. (U.S. Patent No. 5,991,125) in view of Hasegawa et al. (U.S. Patent No. 6,496,338 B2).

Regarding claims 1- 3, 11 and 14 Iwasaki et al. disclose a sensor comprising: first (*Figure 21, element 16*), second (*element 11*) and third ferromagnetic layers (*element 13*) that are interleaved with first (*element 5*) and second (*element 12*) electrically conductive nonmagnetic layers (col. 10, lines 27- 44 and lines 55- 60), said first nonmagnetic layer adjoining said first and second ferromagnetic layers (*elements 14/5/11*), said second nonmagnetic layer adjoining said second and third ferromagnetic layers (*elements 11/12/13*), said first and third ferromagnetic layers having magnetic moments with directions that are fixed in response to an applied magnetic field (*i.e. are "pinned" magnetic layers - see Figure 21 and col. 15, line 61 bridging col. 16, line 4*), said second ferromagnetic layer having a free portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field (*i.e. is a "free" magnetic layer- see Figure 21 col. 10, lines 27- 44*).

Iwasaki et al. fail to disclose the third ferromagnetic layer overlapping only a portion of the second magnetic layer.

However, Hasegawa et al. teach forming a sensor wherein the bias element (*Figure 1, element 35*) only covers an exterior of the free magnetic layer (*element 34*) in order to suppress Barkhausen noise and to pin part of the free magnetic layer by exchange coupling (col. 1, line 56 bridging col. 2, line 47 and Figures 2 and 10).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Iwasaki et al. to form the layers above the free magnetic layer (*Iwasaki et al. - element 11*) such that they only over the outer portion of the free magnetic layer as taught by Hasegawa et al. in order to pin the exterior part of the free magnetic layer via exchange coupling, thereby suppressing Barkhausen noise generation.

Regarding claim 1, in addition to the claim limitations that the Office Action admits are not disclosed, Iwasaki et al. does not disclose a fixed portion of a second ferromagnetic layer.

Moreover, should Iwasaki et al. be modified as proposed by the Office Action, the resulting device would be inoperable. That is, should the device of Iwasaki et al. be modified to form the layers (12, 13, 14 and 15) of Iwasaki et al. above the free layer 11 so that they only cover the outer portion of the free magnetic layer (11), the electrically conductive intermediate layer (12) would be removed, destroying the spin valve effect in the track width region. A person of ordinary skill in the art would have therefore been discouraged from making the modification proposed by the Office Action, believing such combination would destroy the functioning of the device of Iwasaki et al. This is the antithesis of the requirement that the prior art cited must provide an incentive for a modification claimed to render an invention obvious. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

All of the obviousness rejections are based upon this modification of Iwasaki et al. by Hasegawa et al. and are all therefore flawed. For at least these reasons, all the pending claims are nonobvious over Iwasaki et al. modified by Hasegawa et al. as proposed by the Office Action.

Conclusion:

Applicants have responded to each of the items in the Office Action. Applicants believe that the claims are in condition for allowance, and a Notice of Allowance is solicited.

Respectfully submitted,

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Box No Fee Amendment, Commissioner for Patents, Washington, D.C. 20231, on March 26, 2003.

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